COOLING SYSTEM COMPONENTS, REMOVING AND INSTALLING

CAUTION: When performing repair work, especially due to the confined conditions in the engine compartment, pay attention to the following:

- **Route all types of hoses/lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum) as well as electrical wiring so that the original positions are restored.**
- **Ensure sufficient clearance to all moving or hot components.**

NOTE:

- **When the engine is warm, the cooling system is under pressure. If necessary, release the pressure before beginning repair work.**
- **Hoses are secured with spring-type clips. In case of repair, only use spring-type clips.**
- **Assembly tool VAS 5024 or hose clip pliers V.A.G 1921 are recommended for installing spring-type clips.**
- **When installing coolant hoses, route stress-free so that they do not come into contact with other components (observe markings on coolant connection and hose).**

Perform cooling system leakage test with cooling system tester V.A.G 1274 and adapters V.A.G 1274/8 and V.A.G 1274/9.

Cooling system components - body side. See **COOLING SYSTEM COMPONENTS - BODY SIDE** .

Cooling system components - engine side. See **COOLING SYSTEM COMPONENTS - ENGINE SIDE** .

Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**

Draining and filling with coolant. See **COOLANT, DRAINING AND FILLING** .

Coolant mixing ratios. See **COOLANT, DRAINING AND FILLING** .

COOLING SYSTEM COMPONENTS - BODY SIDE

NOTE: The following list refers to items in Fig. 1 .

1. **Radiator**
   - Removing and installing. See **RADIATOR, REMOVING AND INSTALLING**

- After replacing, replace entire quantity of coolant

2. **O-ring**
   - Always replace
3. **Upper coolant hose**
   - Secured to radiator with retaining clip
   - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
4. **Connector**
5. **Cap**
   - Check with coolant system tester V.A.G1274 and adapter V.A.G 1274/9
   - Pressure relief valve must open at a pressure of 1.4 to 1.6 bar
6. **2.5 N.m**
7. **Expansion tank**
   - Perform leak test on coolant system with coolant system tester V.A.G 1274 and adapter V.A.G 1274/8
   - Test pressure: 1.4 to 1.6 bar
   - Observe markings. See **COOLANT, DRAINING AND FILLING** .
8. **To coolant pipe**
   - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
9. **Air ducting**
10. **5 N.m**
11. **Supplementary fan**
    - Only models with optional equipment
12. **Fan ring**
    - For additional fan
13. **Fan ring**
14. **Coolant fan**
15. **Bracket**
    - For coolant fan connector.
16. **Lower coolant hose**
    - Secured to radiator with retaining clip
    - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM** .
17. **O-ring**
    - Always replace
18. **Coolant Fan Control (FC) Thermal Switch -F18-, 35 N.m**
    - For electric fan
    - Switching temperatures:
      1. Speed

on: 92...97 °C

off: 84...91 °C

2. Speed

on: 99...105 °C

off: 91...98 °C

19. **Bracket**
    - For bottom of radiator
    - Note installed position
20. **Bracket**
    - For top of radiator
    - Note installed position

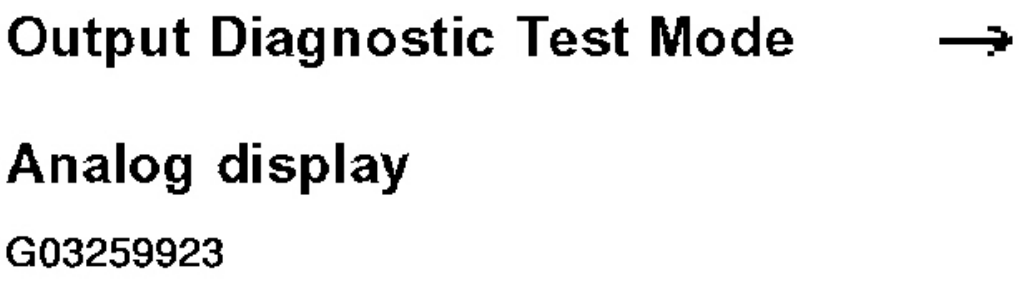

Fig. 1: Identifying Cooling System Components - Body Side
Courtesy of VOLKSWAGEN OF AMERICA, INC.

COOLING SYSTEM COMPONENTS - ENGINE SIDE

NOTE: The following list refers to items in Fig. 2 .

1. **15 N.m**
2. **Coolant pump**
    - Check for ease of movement
    - Note installed position
    - Removing and installing. See **COOLANT PUMP, REMOVING AND INSTALLING**
3. **O-ring**

- Always replace

4. **Bypass flap**
   - For exhaust gas recirculation radiator
5. **Radiator**
   - For exhaust gas recirculation
6. **To top of expansion tank**
   - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
7. **Upper front coolant pipe**
   - Installed with cylinder head cover on front side of cylinder head
   - One unit with fuel lines
8. **Connection union**
9. **Seal**
   - Check for secure seating
   - Always replace
10. **Securing clip**
    - Check for secure seating
11. **Engine Coolant Temperature (ECT) Sensor -G62-**
    - With Engine Coolant Temperature (ECT) Sensor -G2-
12. **10 N.m**
13. **Heating flange**
    - For glow plugs
14. **Glow plugs**
    - 25 N.m
    - Checking. See **GLOW PLUGS, CHECKING** .
15. **Quick-action coupling**
16. **To heat exchanger**
    - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
17. **From heat exchanger**
    - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
18. **Distributor**
19. **To top of radiator**
    - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
20. **Coolant pipe**
21. **40 N.m**
22. **To bottom of expansion tank**
    - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
23. **Transmission oil cooler**

24. **To bottom of radiator**
    - Coolant hose connection diagram. See **COOLANT HOSE CONNECTION DIAGRAM**
25. **Oil cooler**
    - Removing and installing. See **PART 2: DISASSEMBLING OIL FILTER BRACKET** .
26. **Connection union**
    - For thermostat
27. **Thermostat**
    - Removing and installing. See **THERMOSTAT, REMOVING AND INSTALLING** .
    - Observe installed position. See **THERMOSTAT, REMOVING AND INSTALLING** .
    - Checking: Heat-up thermostat in water
    - Starts to open: approx. 85° C
    - Ends: approx. 105° C
    - Opening stroke: min. 7 mm

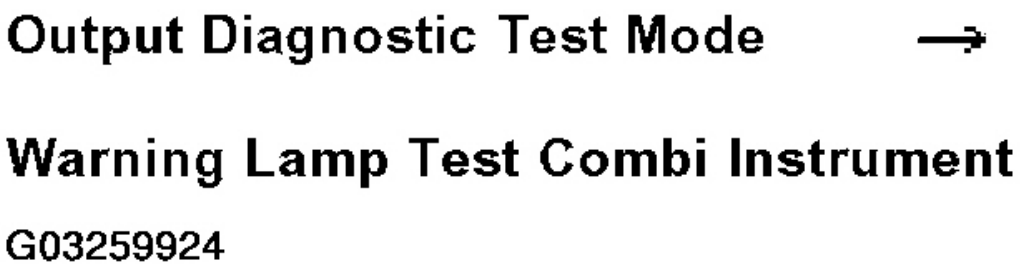

Fig. 2: Identifying Cooling System Components - Engine Side
Courtesy of VOLKSWAGEN OF AMERICA, INC.

COOLANT HOSE CONNECTION DIAGRAM

NOTE: The following list refers to items in Fig. 3 .

1. **Radiator**
2. **Oil cooler**
3. **Thermostat**
4. **Coolant pump**
5. **Cylinder block**
6. **Expansion tank**

7. **Intake manifold**
8. **Radiator**
    - For exhaust gas recirculation
9. **Bypass flap**
    - For exhaust gas recirculation radiator
10. **Connection union**
    - To cylinder block
11. **Heater unit heat exchanger**
12. **Quick-action coupling**
13. **Coolant pipe**
14. **Transmission oil cooler**
15. **Distributor**
16. **Upper front coolant pipe**

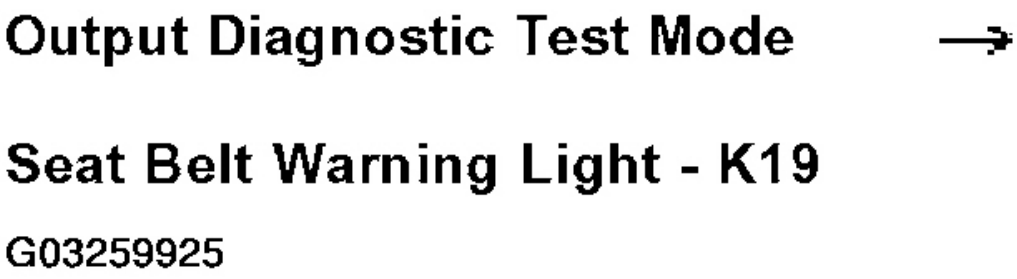

Fig. 3: Coolant Hose Connection Diagram
Courtesy of VOLKSWAGEN OF AMERICA, INC.

COOLANT, DRAINING AND FILLING

Special tools and equipment

- T10007 Refractometer
- V.A.G 1306 Drip tray for VAG1202A
- VAS 5024 Assembly tool for spring-type clips

Not illustrated:

- VAS 6096 Coolant system charging unit

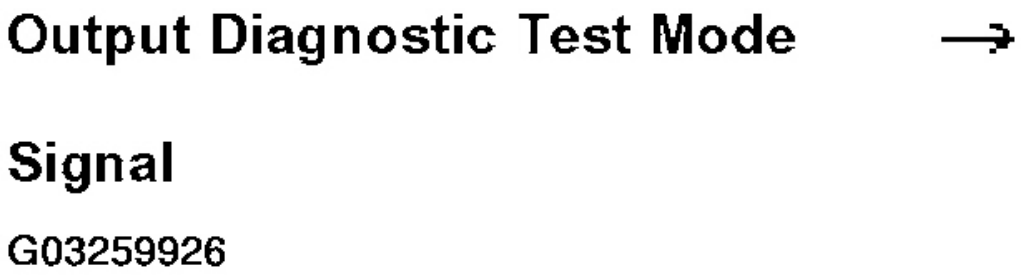

Fig. 4: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Draining

WARNING: Steam can be released when the cap is removed from the expansion tank. Cover cap with a cloth and open carefully.

- Remove cap from coolant expansion tank.
- Remove center and left side sound insulation:

  See **NOISE INSULATION, ASSEMBLY OVERVIEW** .

- Remove drain plug (arrow) from radiator to drain.

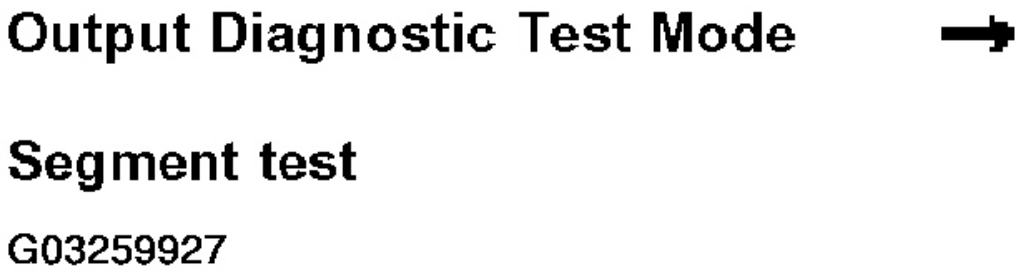

Fig. 5: Removing Drain Plug From Radiator To Drain
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- To drain coolant from engine, remove forward coolant hose from oil cooler (arrow).

NOTE: Observe disposal regulations!

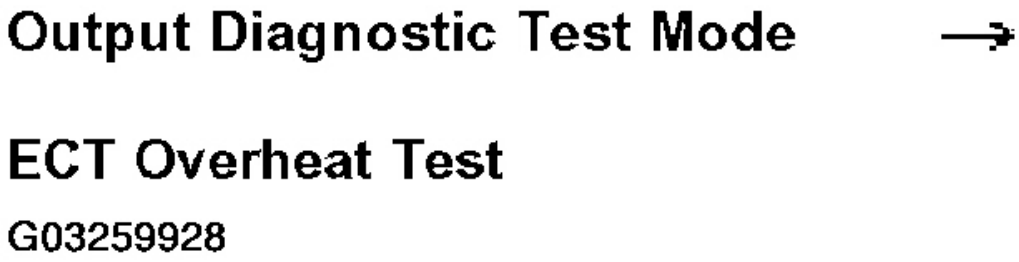

Fig. 6: Removing Forward Coolant Hose From Oil Cooler
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Filling

- Only use coolant additive G12 in accordance with TL VW 774 F. Distinguishing features: lilac (purple) color
- G12 lilac (according to TL VW 774 F) can be mixed with coolant additive G12 red.
- G12 and coolant additives marked "In accordance with TL VW 774 F" prevent frost and corrosion damage, scaling and raise the boiling point of coolant. For this reason the system must be filled all year round with frost and corrosion protection additives.
- Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- Protection against frost must be assured to about -25 °C (in arctic climatic countries to about -35 °C).
- The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti-freeze ratio must be at least 40%.
- If for climatic reasons a higher frost protection is required, the amount of G12 can be increased, but only up to 60% (frost protection to about -40 °C), otherwise frost protection is reduced again and cooling effectiveness is also reduced.
- Refractometer T10007 is recommended to determine coolant freezing temperature.

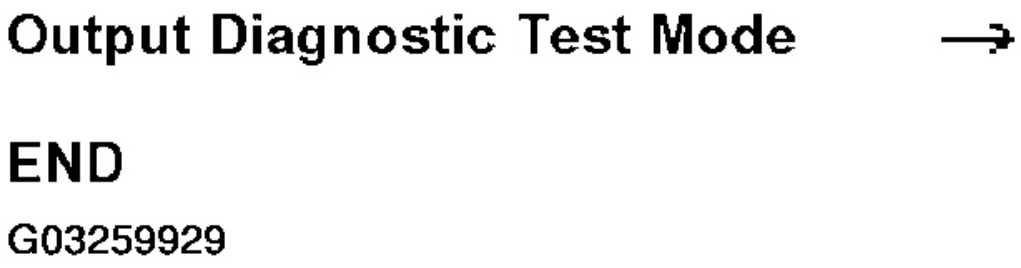

Fig. 7: Identifying Special Tool (Refractometer T10007)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, do not reuse old coolant.

Recommended mixture proportions:

RECOMMENDED COOLANT MIXTURE PROPORTIONS

Anti-freeze to	Anti-freeze proportion	G12(1)	Water(1) , (2)
-25 °C	40%	2.4 liter	3.6 liter
-35 °C	50%	3.0 liter	3.0 liter
(1) The quantity of coolant can vary in dependence on the vehicle equipment.			
(2) Use only clean drinking water.			

- Screw drain plug into radiator.
- Push coolant hose onto oil cooler connection and secure with a spring-type clamp.

With charging unit VAS 6096

- Fill coolant system using coolant system charging unit VAS 6096.

  Refer to instruction manual for coolant system charging unit VAS 6096

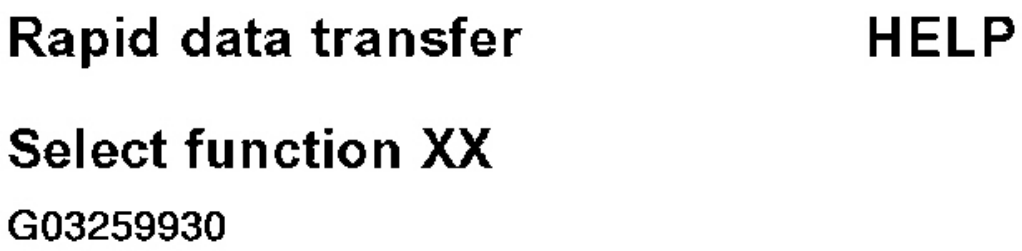

Fig. 8: Pushing Coolant Hose Onto Oil Cooler Connection
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Without charging unit VAS 6096

- Fill coolant slowly up to upper hatched field mark (arrow) on expansion tank.

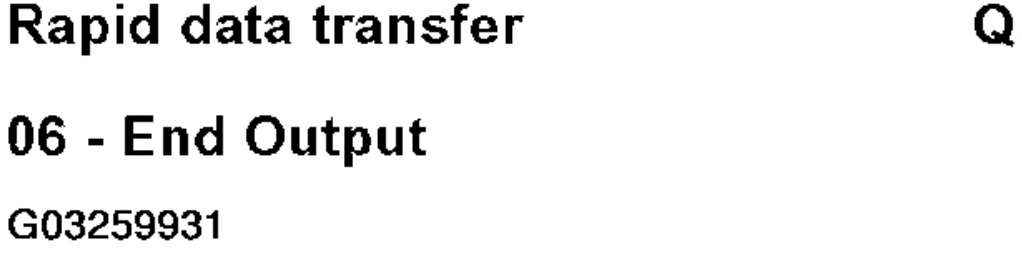

Fig. 9: Filling Coolant Up To Upper Hatched Field Mark On Expansion Tank
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Close expansion tank.
- Run engine until coolant fan cuts-in.
- Check coolant level and replenish if necessary.

  When engine is at normal operating temperature coolant level must lie on upper marking of hatched field (arrow).

  When engine is cold coolant level must lie approx. in middle of hatched field.

RADIATOR, REMOVING AND INSTALLING

Special tools and equipment

- T10007 Refractometer
- V.A.G 1306 Drip tray for VAG1202A
- V.A.G 1331 Torque wrench (5 to 50 N.m)
- VAS 5024 Assembly tool for spring-type clips

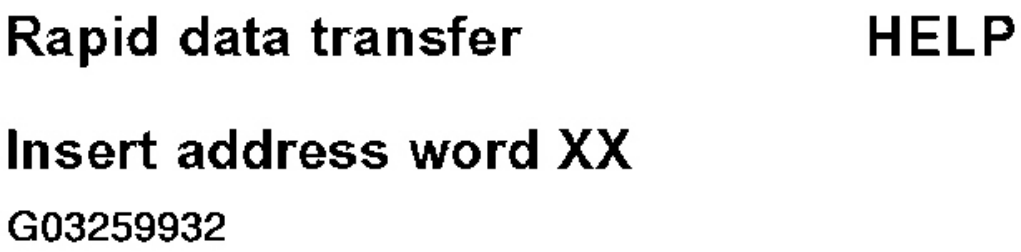

Fig. 10: Identifying Special Tools And Equipment (Radiator)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Drain coolant. See **COOLANT, DRAINING AND FILLING** .
- Remove front end:

  See **FRONT END, ASSEMBLY OVERVIEW** .

- Remove coolant hoses from radiator.
- Remove connectors from thermal switch and coolant fan.
- Remove lock carrier:

  See **LOCK CARRIER, ASSEMBLY OVERVIEW**

- Remove radiator securing bolts and take out radiator.

NOTE: Models with air conditioning system:

- **Observe additional information and removal work. See ADDITIONAL INFORMATION AND ASSEMBLY WORK ON MODELS WITH AN A/C**

SYSTEM .

Installing

Installation is performed in reverse order. Note the following:

- Fill with coolant. See **COOLANT, DRAINING AND FILLING** .

Additional information and assembly work on models with an A/C system

CAUTION: The air conditioning system refrigerant circuit must not be opened.

NOTE: To prevent damage to the condenser as well as to the refrigerant lines, ensure that lines and hoses are not stretched, kinked or bent.

- Release refrigerant lines/hoses from retainers/clamps if necessary.
- Secure radiator to body before removing lock carrier.
- To remove radiator, secure condenser to body.

COOLANT PUMP, REMOVING AND INSTALLING

Special tools and equipment

- T10007 Refractometer
- V.A.G 1306 Drip tray for VAG1202A
- V.A.G 1331 Torque wrench (5 to 50 N.m)
- VAS 5024 Assembly tool for spring-type clips

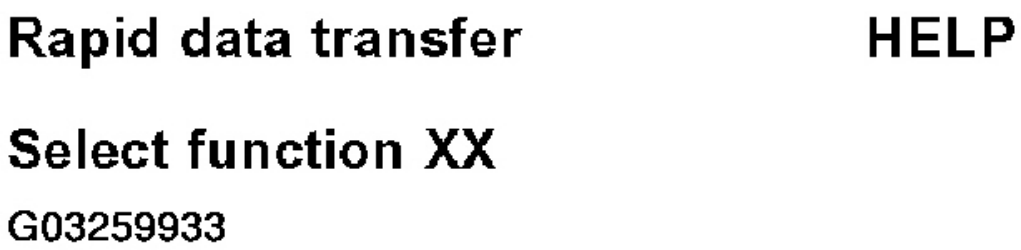

Fig. 11: Special Tools And Equipment (Coolant Pump)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

NOTE: Always replace seals and gaskets.

- Drain coolant. See **COOLANT, DRAINING AND FILLING** .
- Remove toothed (timing) belt. See **TOOTHED BELT, REMOVING AND INSTALLING** .
- Remove coolant pump securing bolts -1- and remove coolant pump -2- carefully.

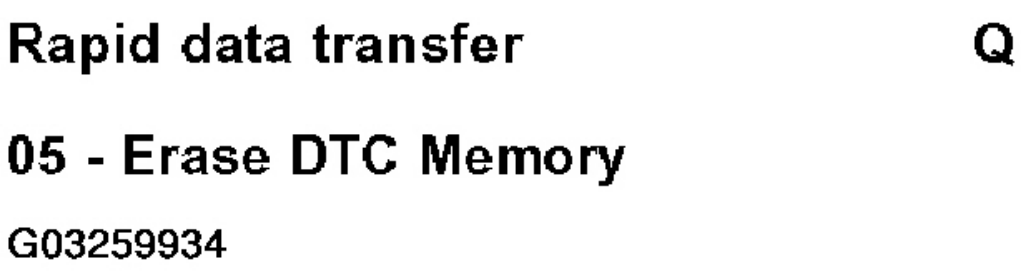

Fig. 12: Removing Coolant Pump And Securing Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing

Installation is performed in reverse order. Note the following:

- Clean or smooth sealing surface for O-ring.
- Moisten new O-ring -3- with coolant.
- Insert coolant pump -2- into cylinder block and tighten securing bolts -1-.

  Tightening torque: 15 N.m

  NOTE: The coolant pump plug faces downward.

- Install toothed (timing) belt. See **TOOTHED BELT, REMOVING AND INSTALLING** .
- Fill with coolant. See **COOLANT, DRAINING AND FILLING** .

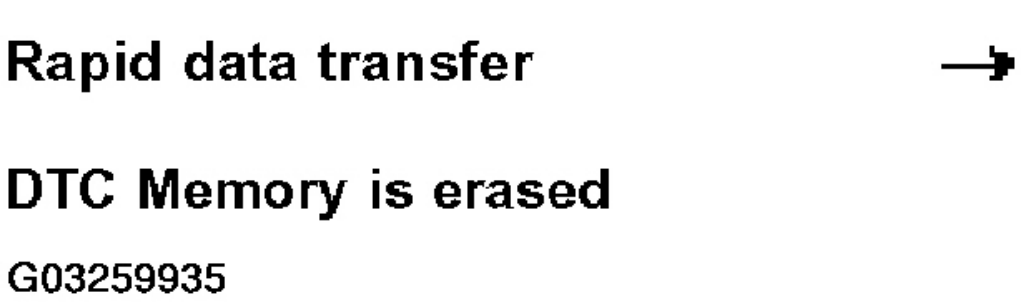

Fig. 13: Identifying Coolant Pump And Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

THERMOSTAT, REMOVING AND INSTALLING

Special tools and equipment

- T10007 Refractometer
- V.A.G 1306 Drip tray
- V.A.G 1331 Torque wrench (5 to 50 N.m)
- VAS 5024 Assembly tool for spring-type clips

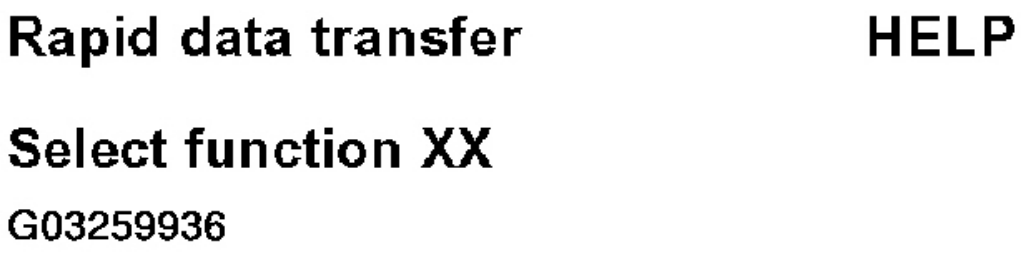

Fig. 14: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

NOTE:

- **Always replace seals and gaskets.**

- Drain coolant. See **COOLANT, DRAINING AND FILLING** .
- Remove coolant hose from pipe union.
- Remove securing bolts -1- of pipe union -2- and remove pipe union -2- with thermostat -4-.
- Turn thermostat -4- 1/4 turn (90°) to left and remove from pipe union -2-.

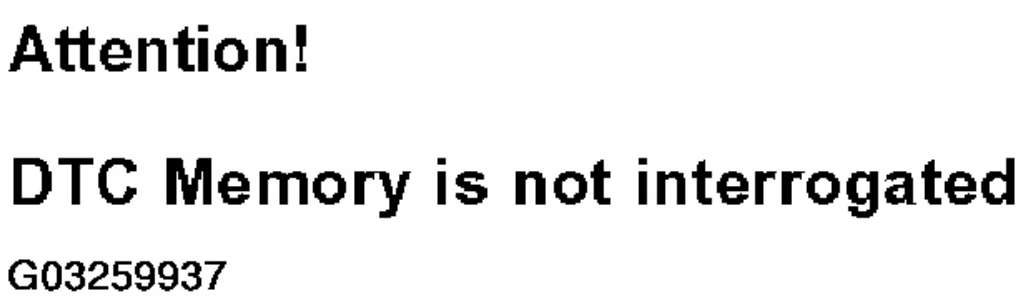

Fig. 15: Removing Pipe Union With Thermostat
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing

Installation is performed in reverse order. Note the following:

- Coat new O-ring -3- with coolant and install to pipe union -2-.
- Insert thermostat -4- into pipe union -2- and turn 1/4 (90°) to right.

NOTE: The brace on the thermostat must be almost vertical.

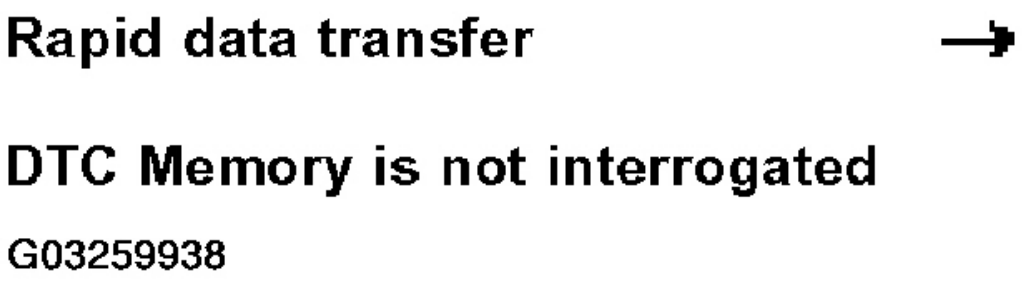

Fig. 16: Installing Connecting Union With Thermostat
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install connecting union -2- with thermostat -4- into engine block.
- Tighten securing bolts -1-.

  Tightening torque: 15 N.m

- Fill with coolant. See **COOLANT, DRAINING AND FILLING** .

GLOW PLUGS, CHECKING

Special tools and equipment

- V.A.G 1594 A Adapter set

Fig. 17: Identifying Special Tools And Equipment (V.A.G 1594 Adapter Set)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1527 B Diode test lamp

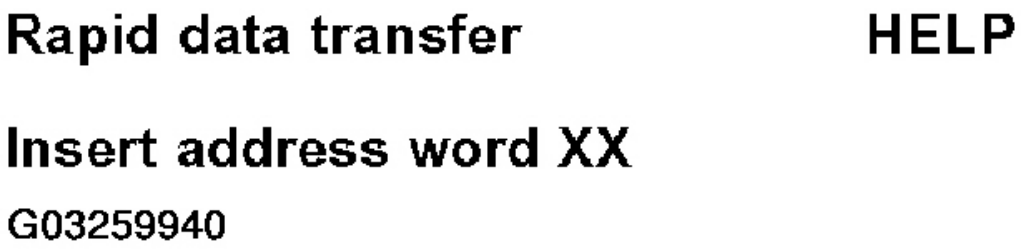

Fig. 18: Identifying Special Tools And Equipment (V.A.G 1527 B Diode Test Lamp)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirements

- Battery voltage at least 11.5 V
- Ignition switched off

Work sequence

Checking electric activation of glow plugs:

- Disconnect connector -1- from glow plugs.
- Connect diode test lamp cable with clamps from adapter set to battery positive (+).
- Insert diode test lamp test pick to every glow plug one after another.

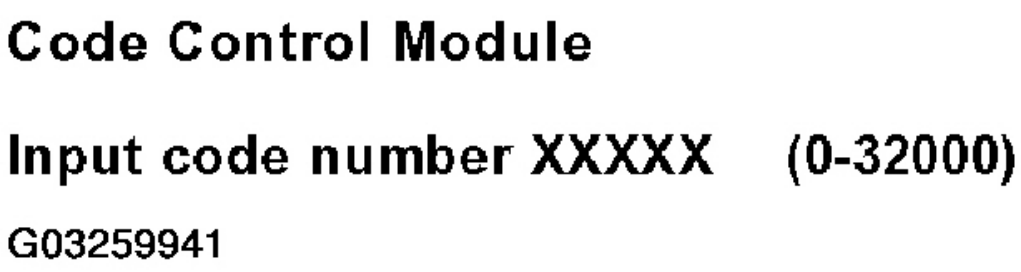

Fig. 19: Using Diode Test Lamp To Check Glow Plug
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Diode lights up: glow plug is OK

Diode does not light up:

- Replace glow plug. See **GLOW PLUGS, CHECKING** .